

## REMARKS

Favorable consideration and allowance of the claims of the present application are respectfully requested.

In the present Official Action, now a Final Rejection, the Examiner rejected Claims 1-23 under 35 U.S.C. §103(a) as allegedly being unpatentable over Schiller (US 2002/0031243) (“Schiller”) in view of Pittel (US 2003/0095708) (“Pittel”).

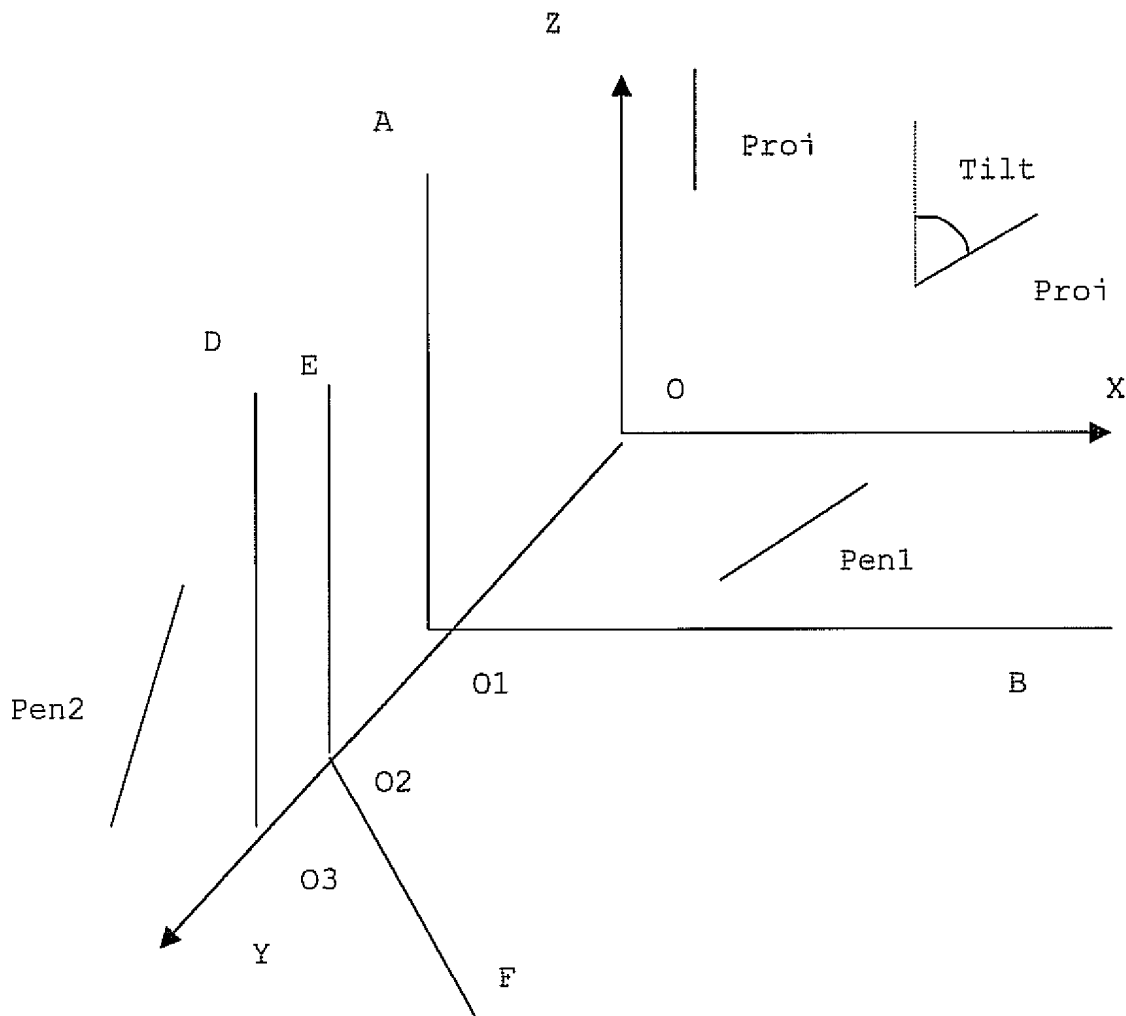
As a preliminary matter, applicants respectfully request the entry of a clarifying amendment to further clarify the claims of the invention, particularly by amending the present claims to include the term passive and having no light sources (i.e. requiring no active light sources or special marking) when referring to the non-electronic stylus. Respectfully, no new matter is being entered as full support is found in the specification by its referring to a “simple” or simple “plastic” stylus or low cost (see ¶¶[0005],[0011], [0026] and [0027] etc. of the present specification).

Further, applicants have canceled Claims 2, 10 and 18 and further amended each respective independent claims 1, 9 and 17 to add the further limitation directed to the extracted non screen-related information including tilt parameters associated with non-electronic, passive stylus manipulation.

With respect to the rejection of Claims 1-23 as obvious over the combination of Pittel and Schiller, applicant’s respectfully disagree. Even if combined with Schiller, Pittel's method either doesn't work in all cases or requires special light sources (being either active or reflectors) because based on the Pittel teachings, three (3) points are needed to discern tilt angle. That is, Pittel actively uses light sources located on a writing pen. While paragraph 28

Pattel suggests that “other implementations might use conventional writing instruments that had no light sources”. But in this case, Pittel would need to have special “reflectors or colored markings”. In any case – active or passive pen – Pattel method will work ONLY if there are three points on a pen as it is explained in paragraphs ¶¶[0039]-[0041] and Figures 2, 4 and 5 of Pittel. If one uses a simple stylus with no light reflectors and no color markings Pattel’s method will simply NOT WORK to provide tilt information.

Moreover, the distinction that Pittel requires three points to discern tilt information versus the present invention that only requires two points to discern tilt information is now explained in view of the Figure provided below for explanation purposes.



In the above figure describing Pattel operation, there is illustrated a basic coordinate system OXYZ and three cases for planes in which Pattel pen is positioned:

1. AO1B which is parallel to the camera plane ZOX (we assume our touch screen is located in plane YOX). There is Pen1 in AO1B plane,
2. DO3Y plane which is coinciding with YOZ plane and there is Pen2 in it,
3. EO2F plane which corresponds to Figure 5 in Pattel – Position C.

Fig. 2 of Pattel teaches how to determine tilt when the pen is located in a plane parallel to the camera plane – case 1. Then, Fig. 5 of Pattel teaches what to do when a pen is located in a plane which is not parallel to the camera plane but rather has an angle less than 90 degrees with axis OX. This is case 3. However, if this angle is 90 degrees exactly, which corresponds to case 2, it is easy to see that one can still not determine tilt based on Pattel's method because the pen will be projected into a line parallel to OZ line.

The present invention, as claimed in amended Claims 1, 9 and 17, does not suffer from this problem because the exact coordinates only need to be determined for two (2) points belonging to a line going through the pen as suggested by the equation (1) at page 7, paragraph [0029] of the originally filed specification.

That is, in the present invention, knowing the line equation (1) allows one not only to find its tilt in any case but also find an angle between planes EO2F and ZOX (or between Position A and Position C lines in Fig. 5 in Pattel). Knowing this angle adds to the accuracy of handwriting recognition.

Pattel's method can not find this tilt angle as explained above.

Further, applicants have further amended each respective independent claims 1, 9 and 17 to add the further limitation directed to the tilt parameters determined by two points in three-dimensional space. Respectfully, no new matter is being entered as full support is found

in the specification (See Fig. 6, coordinates L and U in XYZ space each point of which is described by 3 coordinates in the XYZ space ( $U_x, U_y, U_z$  and  $L_x, L_y, L_z$ ) as taught at ¶¶[0029]-[0030] of the present specification).

That is, from the discussion concerning the line equation (1) of the present application, it is given that  $L_z=0$  because lower end of the passive stylus L touches the PDA touch screen and, coordinates  $L_y$  and  $L_x$  are known from the screen controller device that controls touch screen data acquisition. Further, as a result of processing the digital video camera images, the lengths  $U_x$  and  $U_z$  may be extracted. Thus, simple geometry dictates that as long as  $U_y$  is known, then stylus tilt may be calculated. From equation (1),  $U_y$  may easily be determined given all this information. Thus, knowing  $U_y$ , the tilt angle of the stylus is easily calculated because the knowledge of three coordinates ( $x, y$  and  $z$ ) for two points L and U completely defines line (LU) and so it is possible to calculate the tilt angle, in addition to the tilt in another plane – which is an angle between projection of the pen onto plane YOX and OX line. Knowledge of this angle will also improve handwriting recognition.

Given this, the present invention, thus, does not require any special features of a pen – just simple plain one-color stylus having no light source will work because of the combination of touch screen data and camera obtained data. Usage of a touch screen in the present invention, provides the true coordinates of the stylus and allows one to solve the geometrical problem in all cases as opposed to the combination of Schiller and Pattel which would be deficient given the inability of the Pittel to discern certain tilt angles as described.

Thus, in view of the clarifying amendments, Schiller and Pittel does not render the present invention obvious and the Examiner is respectfully requested to withdraw the rejections of independent Claims 1, 9 and 17 under 35 U.S.C. §103(a) as being unpatentable

over Pittel in view of Schiller whether taken alone or in combination, and, further, to withdraw the rejections of all remaining dependent claims. With respect to remaining dependent claims, Claims 4-5, 12-13 and 19-20 are being amended to correct their dependencies in view of the canceled claims 2, 10 and 18.

Moreover, in addition to the foregoing, applicant additionally submits that he has provided a “hybrid” system that combines two on-line systems: touch screen and camera - both of which provide dynamic - on-line - information about how the writing is created. That is, the handwriting recognition means receives both the dynamic touch screen information and extracted non touch screen-related information from the processed images.

Moreover, while Schiller teaches the use of a touch screen device (digitizing pad) on a PDA, applicant respectfully submits that this is only one aspect which is the traditional prior art aspect of using a tracking device for dynamic handwriting recognition (captured data is 2-dimensional X, Y vectors (See paragraph [0060] of Schiller)) obtained from the actual writing on the plane of the digitizing pad. Thus, Schiller includes software that will do the handwriting recognition based on the touch screen – only- and thus corresponds to a prior art system described in the present invention with respect to filed Fig. 2.

Moreover, while Pittel does speak to using a digital camera for hand motion capturing in general, the thrust of Pittel is the application of a digital camera with any portable device, i.e., a device characterized by Pittel as NOT HAVING a touch screen to perform handwriting and handmotion recognition. The Pittel system thus only corresponds to a prior art system described in the present invention with respect to Fig. 1.

Applicant strongly believes that the time between the filing of Schiller (April 2000) and Pittel (Nov. 2001) and the time of filing of the present invention (Nov. 2003) is a

testament to the unobvious nature of the hybrid system of the present invention. While the Examiner notes on page 2 of the office action that Schiller suggests using handwriting recognition utilizing touch screen “and pen tilt information”, again, as mentioned above, the combination would have suggested an unworkable solution for isolated cases (e.g., corresponding to case 2 above one can still not determine tilt based on Pattel’s method because the pen will be projected into a line parallel to OZ line).

The present invention solves this problem by the hybrid system implementing the line equation which enables extraction of non screen-related information including tilt parameters associated with non-electronic, passive stylus manipulation, the tilt parameters determined by two points in three-dimensional space which is not rendered obvious by such a combination of Pittel and Schiller.

Moreover, Pittel’s calculation of the tilt using a camera device is valid only in the case when the pen used is an “active” pen -meaning the pen has light sources (LEDs, IR, or other sources) embedded in it. See, for example, [0027], [0028] [0042]-[0043] in Pittel as well as Fig. 2, 3, 4 and 5.

The present invention, as set forth in amended Claims 1, 9 and 17 rather, teaches a low-cost implementation when pen is just a simple passive and non-electronic stylus.

Moreover, Schiller provides a pure handwriting recognition solution for a touch screen device (digitizing pad) on a PDA with absolutely no teaching or suggestion that this system is combinable with a camera based system for tracking non-electronic stylus pen movement associated with the handwriting.

Pittel does not teach or suggest use of handwriting recognition as the implementation described in Pittel does not lend itself to, and actually teaches away from, use of a touch

sensitive screen (Claims of Pittel explicitly state that the display is not touch sensitive). Pittel only provides for handwriting recognition based on the digital camera information. There is no system, nor software described in Pittel that will do the handwriting recognition based on the touch screen - only camera information is used. For example, see Pittel at paragraph [0004], seven lines from the bottom where it is explicitly stated that "The display is not touch sensitive", and see Pittel also at paragraph [0071] where it is described that the writing surface may be absent at all.

Thus, the two references are non-combinable as each, being stand-alone handwriting recognition systems of disparate modalities, teaches away from the use of the other. Heretofore, there has never been any teaching or suggestion to combine the two disparate handwriting recognition systems in the low-cost manner as now claimed.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Accordingly, it is respectfully requested that this application be allowed and a Notice of Allowance be issued. If the Examiner believes that a telephone conference with the Applicants' attorneys would be advantageous to the disposition of this case, the Examiner is requested to telephone the undersigned, Applicants' attorney, at the following telephone number: (516) 742-4343.

Respectfully submitted,



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